

Claims

1. A laser material processing method for processing a printed wiring board to form a blind hole, a groove or a through hole by applying a laser beam to an insulating layer of said printed wiring board, including:

a first step of processing said insulating layer at a predetermined energy density;

a second step of hardening said insulating layer by applying a laser beam at a lower energy density than said predetermined energy density of said first step around a processed portion processed in said first step; and

a third step of removing the residual smear.

2. The laser material processing method according to claim 1, characterized in that the energy density is $0.5\text{J}/\text{cm}^2$ or less in said second step.

3. The laser material processing method according to claim 1, characterized in that the energy density is $0.6\text{J}/\text{cm}^2$ or less in applying laser beam to said insulating layer made of polyimide resin in said second step.

4. The laser material processing method according to any one of claims 1 to 3, characterized in that the area to apply laser beam in said second step is about double the processed area in said first step.

5. The laser material processing method according to any

one of claims 1 to 4, characterized in that a carbon dioxide gas laser having a wavelength of $10.6\mu\text{m}$ is used for the laser material processing.

6. A laser material processing method for processing a printed wiring board to form a blind hole, a groove or a through hole by applying a laser beam to an insulating layer of said printed wiring board, including:

a first step of processing said insulating layer at an energy density of $15\text{J}/\text{cm}^2$;

a second step of hardening said insulating layer by applying a laser beam at an energy density of $0.5\text{J}/\text{cm}^2$ or less around a processed portion processed in said first step; and

a third step of removing the residual smear.

7. The laser material processing method according to any one of claims 1 to 7, characterized in that one pulse of laser beam is applied for a pulse beam on time of $10\mu\text{s}$ in said second step.

8. The laser material processing method according to any one of claims 1 to 7, characterized in that laser irradiation in said first step and laser irradiation in said second step are performed at the same time.